REMARKS/ARGUMENT

Reconsideration is respectfully requested.

The claims have been rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent 5,316,596, Katoga. This rejection is respectfully traversed. The present application as indicated in the title pertains to a wear resistant alloy containing residual austenite. The preferred utilization for the alloy is for a valve seat insert.

The basic microstructure of a typical wear resistant alloy is composed of hard alloy carbides and a matrix strengthened by solid solution and precipitation mechanism. There are two major types of matrix, martensite and austentite, available for wear resistant alloys. Martensite normally has higher strength and higher hardness while austentite has better plastic deformation ability for iron base alloys. For abrasion wear with hard abrasives martensite matrix usually provides better wear resistance than austentite type matrix due to its high hardness, while austentite matrix has better wear resistance where wear process contains impacting component. In certain intake valve seat insert working conditions impacting is an important factor in the wear process, therefore the objective of the invention is to develop a novel alloy containing a large amount of retained austentite for its good plastic deformation ability to improve wear resistance. (See summary in ¶ 10) Unlike US patent 5,316,596 where retained austentite is harmful to its wear resistance in hot rolling process, in applicant's invention retained austenite is viewed as a favorable phase in the microstructure of the alloy.

One of the distinct advantages of the present application over the prior art is that the present invention seeks to obtain a large amount of stable retained austenite for better

wear resistance such as that utilized at valve seat intake temperature. This is to be contrasted with the '596 reference which teaches a wear resistant alloy that does not contain any austenite for hot rolling mill rolls. As a matter of fact that prior art retained austenite is viewed as an unfavorable phase in its microstructure because high hardness and stable microstructure are required by hot rolling mill rolls. For this reason, a nickel content is chosen by the prior art as an optional alloy element that should be 5.5% or less.

Applicant has found that the combination of a large amount of residual austenite and a small amount of martensite offers better wear resistance and wear compatibility than pure martensitic matrix type alloys used in traditional iron based VSI alloys. The existence of martensite in the matrix increases the hardness of the inventive alloys that is an important parameter to indentation resistance of VSI (See Summary of the Invention on page 3).

Applicant has evaluated the different alloys in the present application and has recorded same with and without magnetic capabilities. It has been found that the difference in weight with and without magnetic capabilities is the magnetic attraction force. Since residual austenite is ferri magnetic and martensite is ferro-magnetic, the more residual austenite in a sample alloy, the less the magnetic attraction force (see page 7 of the Specification, lines 3 and following).

Too high a nickel content in U.S. 5,316,596 will lead to the formation of retained austentite in the alloy that is harmful to its wear resistance. In the present invention one needs to use much higher nickel content and other alloy elements plus heat treatment restrictions to get a large amount of stable retained austenite. Through studies, it has

been found that nickel content should be most preferably equal or greater than 8.0% and equal or less than 12.0% to meet valve seat insert size stability requirement (Figure 2). From patent protection view nickel range was set as 3.0-15.0%, however, it is acceptable to use 7.0-15.0 wt % nickel for this alloy as the narrower nickel range will ensure a better stability of the alloy. See Figures 2 and 5.

As can be seen from Figure 2, there is a substantial decrease in magnetic force from 7.0% wt nickel on up. Accordingly therefore the original claims have been revised to indicate that the amount of nickel is from 7 to 15 wt %. Support for the change is throughout the specification and in particular figure 2 of the specification and claims 1 and 9. It should be noted from the '596 specification that alloy P causes lowering of wear resistance and the crack resistance (col. 7, lines 3-4). See also in embodiment 2 of the '596 patent where nickel is undesirable see, col. 7, lines 37-40 where material N is undesirable and the same applies with respect to embodiment 3 of the '596 reference where the same undesirable properties are associated with excess content of nickel (col 8, lines 15-17).

Therefore, it is respectfully submitted that the present application not only has claims that are distinct from the prior art but also that the overall approach to obtaining a desirable alloy in particular one for a valve seat insert is not suggested by such prior art.

Taking into account applicant's concern of addressing the magnetic properties of a stable austenite alloy, applicant has taken into account tungsten. Tungsten is another carbide forming element. Its effects to mechanical properties are similar to molybdenum, and therefore are considered to be interchangeable with molybdenum based on atomic

weight. In US 5,316,596 tungsten was added for better high temperature properties and also strengthening matrix of the hot rolling mill rolls. As stated in US 5,316,596, tungsten is an element having high specific gravity to promote segregation of proeutectoid carbide during centrifugal casting if excessively added. Therefore, the upper limit of tungsten is set at 1.0% due to segregation consideration in centrifugal casting process for hot rolling mill rolls in this prior at. On the other hand, it has been found that tungsten has a different effect than molybdernum on the stability of the retained austenite. Addition of tungsten to 6 wt % decreases the stability of residual austentite. Hence tungsten content may be controlled less than 6.0 wt %, not less than or equal 1.0 wt % in U.S. 5,316,596.

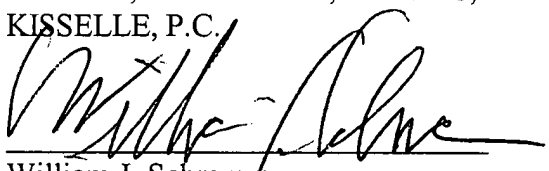
Accordingly, applicant has added additional claims with respect to tungsten namely in a range of .5 to 6% which is supported by the original specification and claim 13. Newly added claims 16, 17, 18 and 19 are correspondingly supported by the specification and the claims.

Because there is no suggestion in the prior art cited to consider the magnetic force of the alloy in its relationship to an alloy's ability to be a wear resistant alloy, applicant has added Claims 20-33. Support is found throughout the specification and original claims but especially in paragraphs 21 (page 7), 36 (page 15) and 39 (page 17). The claims outline a testing procedure for the alloy property with liquid nitrogen as outlined in the specification.

In view of the above it is believed that the case is in condition for allowance and a notification of allowance is respectfully requested. Should the Examiner wish to contact the undersigned the Examiner may call collect.

Respectfully submitted,

REISING, ETHINGTON, BARNES,
KISSELLE, P.C.



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